

Our response: In IPCC AR4 simulations, models were run with natural and anthropogenic (i.e., GHG) forcing for the period of the observational record (i.e., the 20th century). Results from different models and different runs of the same model can be used to simulate the observed range of natural variability in the 20th century (such as warm in 1930s and

cool in the 1960s). Only when GHG forcing is added to natural variability, however, do the models simulate the warming observed in the later portion of the 20th century (Wang et al. 2007). This is shown for the Arctic by Wang et al. (2007, pp. 1,093–1,107). This separation is shown graphically in Figure SPM-4 of the IPCC AR4 (shown below, reproduced from IPCC 2007 with

permission); note the separation of the model results with and without greenhouse gases at the end of the 20th century for different regions. Thus comparison of forced CO₂ trends and natural variability were central to the IPCC AR4 analyses, and are discussed in this final rule.

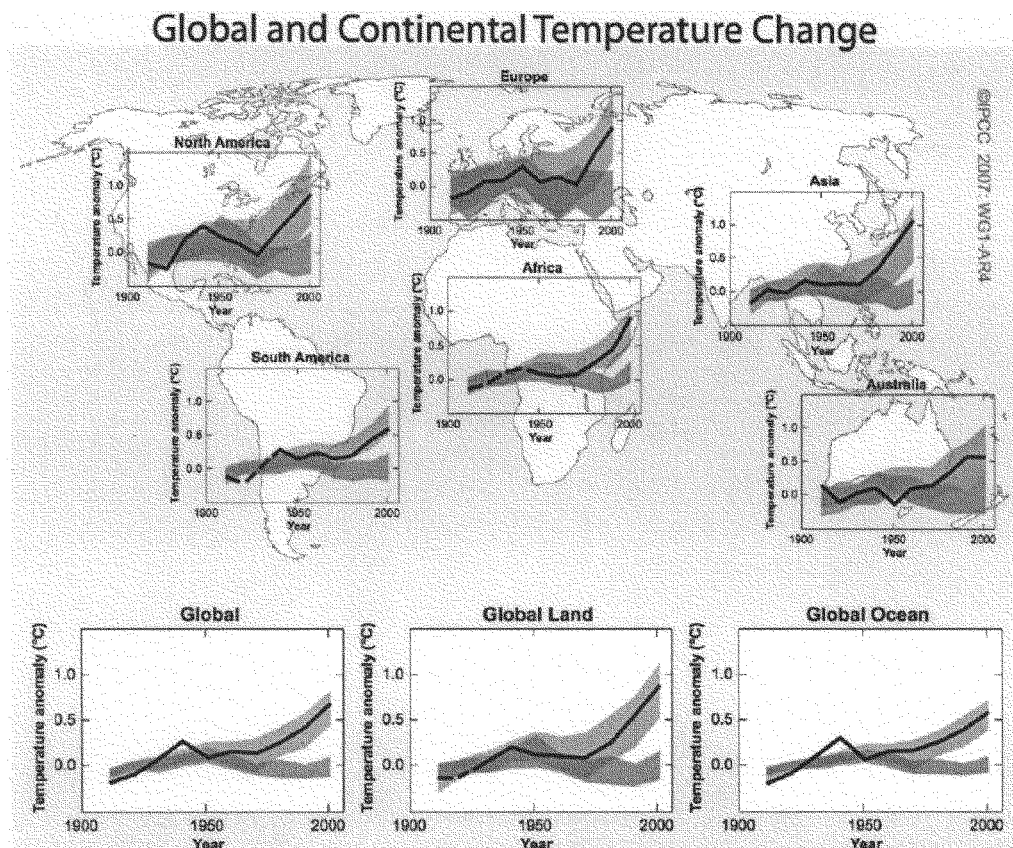


FIGURE SPM-4. Comparison of observed continental- and global-scale changes in surface temperature with results simulated by climate models using natural and anthropogenic forcings. Decadal averages of observations are shown for the period 1906–2005 (black line) plotted against the centre of the decade and relative to the corresponding average for 1901–1950. Lines are dashed where spatial coverage is less than 50%. Blue shaded bands show the 5–95% range for 19 simulations from 5 climate models using only the natural forcings due to solar activity and volcanoes. Red shaded bands show the 5–95% range for 58 simulations from 14 climate models using both natural and anthropogenic forcings. (FAQ 9.2, Figure 1)

Analyses of paleoclimate data increase confidence in the role of external influences on climate. The GCMs used to predict future climate provide insight into past climatic conditions of the Last Glacial Maximum and the mid-Holocene. While many aspects of these past climates are still uncertain, climate models reproduce key features by using boundary conditions and natural forcing factors for those periods. The IPCC AR4 concluded that a substantial fraction of the reconstructed Northern Hemisphere

inter-decadal temperature variability of the seven centuries prior to 1950 is *very likely* attributable to natural external forcing, and it is *likely* that anthropogenic forcing contributed to the early 20th-century warming evident in these records (IPCC 2007).

Comment 33: Current climate patterns are part of the natural cycle and reflect natural variability.

Our response: Considered on a global scale, climate is subject to an inherent degree of natural variability. However, evidence of human influence on the

recent evolution of climate has accumulated steadily during the past two decades. The IPCC AR4 has concluded that (1) most of the observed increase in globally-averaged temperatures since the mid-20th century is *very likely* due to the observed increase in anthropogenic GHG concentrations; and (2) it is *likely* there has been significant anthropogenic warming over the past 50 years averaged over each continent (except Antarctica) (IPCC 2007, p. 60).